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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Kumar et al.	
Applic No.: 09/136,483	
Filed : August 19, 1998	Group Art Unit: 1755
For : ALUMINUM OXIDE PARTICLES	Examiner: M. Marcheschi
Docket No.: N19.12-0016	

REPLY BRIEF FOR APPELLANT

BOX AF
Assistant Commissioner for Patents
Washington, D.C. 20231

I HEREBY CERTIFY THAT THIS PAPER IS BEING SENT BY U.S. MAIL, FIRST CLASS, TO THE ASSISTANT COMMISSIONER FOR PATENTS, WASHINGTON, D.C. 20231, THIS 02 DAY OF January, 2001

Peter D. Pedi
PATENT ATTORNEY

Sir:

This is a Reply Brief under 37 C.F.R. §1.193(b)(1) in response to the Examiner's Answer mailed November 16, 2000. Applicants/Appellants reply to three issues raised by the Examiner in the Examiner's Answer. First, legal issues regarding obviousness in the present context of claims 1-3, 5-16 and 19-22 are discussed in depth. Second, issues raised by the Examiner regarding the disclosure in the Rostoker '194 patent are discussed in detail. In addition, issues regarding claims 18-19 are clarified.

Legal Standards Relevant When New Properties Are Claimed

The present claims are directed to compositions of matter. Applicants believe that the In re Gross and In re Irani cases discussed below are on point with respect to relevant legal criteria for establishing obviousness of compositions of matter that have compositional properties distinct from prior art compositions of matter. Other cases below provide further context for evaluating the patentability of compositions of matter.

The claimed aspects of the present invention are

chemical/compositional properties that make the material a different composition of matter. In particular, Applicants' **claimed compositions** have several compositional features. First, the composition of matter is a collection of particles. The particles comprise aluminum oxide. Also, the particles have a specified range of **average** particle sizes. Average particle size is a chemical/compositional property similar to chemical formula or molecular weight of a polymer. Collections of particles with one average particle size are a different composition of matter and will have different physical properties from collections of particles with other average particle sizes.

Similarly, the distribution of particle sizes is another independent chemical/composition property of solid particles that is **distinct** from the average particle size. **A particle collection with a particular particle size distribution is a different composition of matter and will have different physical properties from other collections of particles with different particle size distributions.** Applicants have developed an approach using laser pyrolysis to produce the highly uniform aluminum oxide powder, which is the subject of the present claims.

It is long established that a composition of matter is indistinguishable from its properties. In re Papesch, 137 USPQ 43, 51 (CCPA 1963); In re Cescon, 177 USPQ 264, 266 (CCPA 1973). There are two types of properties, chemical/compositional properties and physical properties. The chemical/compositional properties of the composition of matter determine what the material is, while the physical properties relate to the interaction and behavior of the composition of matter. Often unique or unexpected physical properties are used to establish the existence of an unobvious composition when chemical/compositional properties either are unknown or do not fully represent the unobviousness of the composition. However, discovery of a surprising or unexpected physical property does not necessarily control an obviousness

determination, and all the evidence under the Graham factors must be considered. See, for example, Richardson-Vicks v. Upjohn Co., 44 USPQ2d 1181, 1187 (Fed. Cir. 1997).

Obviousness under 35 U.S.C. §103 must be evaluated by viewing the invention as a whole. In re Langer, 175 USPQ 169, 171 (CCPA 1972). "In effect, we consider the prior art 'as a whole' with the claimed subject matter 'as a whole.'" Id. This rule superseded other principles, and specifically, "homology should not be automatically equated with prima facie obviousness." Id. "To give meaning to the language of 35 U.S.C. 103 which speaks to the subject matter 'as a whole,' **we feel weight must be given the properties of a compound or composition of matter.**" In re Murch, 175 USPQ 89, 92 (CCPA 1972)(emphasis added). "It has long been our position that a compound and its properties are inseparable and that **no property can be ignored in determining patentability over the prior art."** In re Cescon, 177 USPQ at 266.

It is also well established that a composition of matter is not unpatentable if the prior art does not teach a method for making the composition of matter. In re Hoeksema, 158 USPQ 596 (CCPA 1968). If the prior art does not teach a method of making the composition of matter, the public is not in possession of the composition of matter.

These issues were considered explicitly in In re Grose, 201 USPQ 57 (CCPA 1979). The issue in the Grose case was the crystal structure of zeolites in a collection of zeolite particles. Crystal structure, like particle size distribution, is a chemical/ compositional property of the composition of matter. The zeolites in the Gross case were collections of particles, i.e., a powder. The relevant issues are well stated in In re Grose:

> Though nonobviousness of appellants' process for preparing their claimed composition would not be determinative of nonobviousness of the composition, a holding that the composition would have been nonobvious would require that the prior art fail to disclose or render obvious a process for preparing it.

> [I]f the prior art of record fails to disclose or render obvious a method for making a claimed compound, at the time the invention was made, **it may not be legally concluded that the compound itself is in the possession of the public**. In this context, we say that the absence of a known or obvious process for making the claimed compounds overcomes a presumption that the compounds are obvious. ***
>
> In re Hocksema, 55 CCPA 1493, 1500, 399 F.2d 269, 274, 158 USPQ 596, 601 (1968)(foot note omitted). **Failure of the prior art to disclose or render obvious a method for making any composition of matter, whether a compound or a mixture of compounds like a zeolite, precludes a conclusion that the compound would have been obvious.**

In re Grose, 201 USPQ at 63-64 (emphasis added). Applicants note that in In re Grose the zeolites had the same chemical formula as the prior art zeolites and only differed in crystal structure.

"No reason exists for applying the law relating to structural obviousness of those compounds which are homologs or isomers of each other to this case. When the PTO seeks to rely upon chemical theory, in establishing a prima facie case of obviousness, it must provide evidentiary support for the existence and meaning of that theory. In re Mills, 47 CCPA 1185, 1191, 281 F.2d 218, 223-224, 126 USPQ 513, 517 (1960)." In re Grose, 201 USPQ at 63.

"One of the assumptions underlying a prima facie obviousness rejection based upon a structural relationship between compounds, such as adjacent homologs, is that a method disclosed for producing one would provide those skilled in the art with a method of producing the other. That assumption does not apply, however, to the present case." Id. Thus, if the prior art does not teach a method for making the claimed composition, the claimed composition of matter is not prima facie obvious. If the composition of matter is not prima facie obvious, there is no necessity to disclose unexpected results.

Another CCPA case similarly ruled that an anhydrous

crystalline form of a material was patentable over a non-crystalline form. In re Irani, 166 USPQ 24 (CCPA 1970). As stated in that case,

> As stated above, even assuming that one skilled in the art could have predicted with reasonable certainty that crystalline anhydrous ATMP could be produced, we are not convinced by this record how this could be achieved. We note that neither the examiner nor the board has contended that a suitable process would have been obvious. The closest that either has come to such a contention is the examiner's statement based on the disclosure in the Irani patent, that, as it turns out, 'little modification of the Petrov *** process will produce a crystalline material.' Obviousness, however, must not be based on hindsight and a 'little modification' can be a most unobvious one.
>
> **In view of the foregoing, we need not consider appellants' arguments regarding the differences in properties between appellants and Petrov's forms of ATMP.**

In re Irani, 166 USPQ at 27 (bold added). **This case explicitly confirms that unexpected results do not need to be shown if there is no disclosure in the prior art of a method of producing the composition of matter.**

The Examiner's position, as stated at page 4 in the Examiner's Answer, is stated as: "Rostoker et al. teach a polish comprising alumina particles having a size within the claimed range and therefore no distinction is seen to exist because the subject matter as a whole would have been obvious to one of skill in the art at the time the invention was made to have selected the overlapping portion of the range disclosed by the reference because overlapping ranges have been held to be a prima facie case of obviousness." This position unfortunately is **legally in error** because it only accounts for the average particle size. The case law is clear that **all properties of a composition of matter must be taken into account in evaluating patentability, including the present particle size distribution.**

Applicants do not dispute that the prior art discloses alumina particles with corresponding average particle sizes. But

the particle size distribution **must be considered separately** since it is an independent property. By analogy, if crystallinity is at issue, the stoichiometry of the composition is not determinative of patentability even though stoichiometry directly affects available crystal structures. See, In re Grose and In re Irani above. With respect to particle size distribution independent of average particle size, the Examiner has not indicated what ranges are overlapping. Unless the Examiner can point to overlapping ranges relating to particle size distribution, independent of average particle size, In re Malagari just is not relevant. The relevant cases are In re Grose and In re Irani, above.

A collection of particles having a narrower particle size distribution is analogous to a more pure composition of matter. In other words, a powder with a narrower particle size distribution corresponds to a more uniform material. Thus, relevant case law regarding purity of compositions of matter should be considered also.

"It seems to us that the answer to that question is self-evident: by definition, pure materials necessarily differ from less pure materials and, if the latter are the only ones existing and available as a standard of reference, as seems to be the case here, perforce the 'pure' materials are 'new' with respect to them." In re Bergstrom, 166 USPQ 256, 262 (CCPA 1970).

Thus, if a compound with a particular molecular formula cannot be made based on the teachings in the prior art, the compound is patentable if a method is discovered for making the compound. Similarly, a collection of particles is patentable if the prior art did not disclose a method of producing the collection of particles. **In particular, if a collection of particles with a narrower distribution of particle sizes is discovered, this collection of particles is patentable over the prior art if the prior art did not disclose an obvious method of making the highly uniform particles.**

The Examiner seems to assert that all particle size distributions overlap all other particle size distributions if they have overlapping average particle sizes. However, the particle size distribution is an independent property from the average particle size. Particle size distribution, like crystal structure of zeolites in the In re Grose case discussed above, is a compositional property of the composition of matter that defines the composition of matter. The Examiner has suggested that Applicants demonstrate unexpected properties. However, the case law is crystal clear, see In re Grose and In re Irani above, that Applicants have no need to show unexpected result relating to physical properties **unless the prior art teaches a method of making Applicants' claimed composition of matter** including all of its chemical/compositional properties.

Applicants believe that the prior art does not teach highly uniform alumina particles or method for making highly uniform alumina particles disclosed and claimed by Applicants and that the Examiner has not met his burden with respect to establishing prima facie obviousness of any of Applicants' claims.

Issues Regarding the Rostoker Patent

Under the Final Rejection in the Office Action of February 29, 2000, the Examiner rejected the claims over several prior art references. The art is summarized in Applicants'/Appellants' Main Brief. In the Examiner's Answer only the rejection over Rostoker et al. (194) alone or in view of Ueda et al. is discussed. Applicants assume that the other rejections are maintained even though they are not discussed. If this is incorrect, Applicants respectfully request clarification of this point.

Applicants claim a collection of particles in claim 1, 19 and claims depending therefrom. The collection of particles have three distinct characteristics. First, they comprise aluminum

oxide. Second, they have an average particle size from about 5 nm to about 500 nm. Third, they have a characteristic relating to the particle size distribution, which involves the uniformity of the particles. According to claim 1, the particles have less than 1 in 10^6 particles with a diameter greater than three times the average diameter. According to claim 19, the particles have a distribution of diameters such that at least about 95 percent of the particles have a diameter greater than about 40 percent of the average diameter and less than about 160 percent of the average diameter.

With respect to the particle size distribution, the Examiner asserted that Applicants are ignoring the teaching in column 7 and the claims of the Rostoker patent. Applicants are not ignoring these teachings. Applicants have struggled to understand the precise meaning of the terms in the Rostoker patent with respect to their asserted distributions. If the Examiner can explain how the distributions described in the Rostoker patent fall within Applicants' claimed distributions, Applicants would appreciate such an explanation so that the issue can be directly addressed. Having failed in the attempt to relate the Rostoker distribution with Applicants claimed distribution, Applicants turned to the teachings of the Rostoker patent relating to the formation of aluminum oxide.

The Rostoker patent does not teach the formation of aluminum oxide and only includes prophetic examples. For support of the synthesis of aluminum oxide, the Rostoker patent refers to a patent by Siegel et al. The Siegel patent is discussed in detail in Applicants' main brief. Applicants have not asserted that the Siegel patent is the only way to make aluminum oxide. However, the Kambe Declaration was submitted by Applicants as support that other approaches for the formation of Applicants' claimed invention are not available. **The Examiner has failed to contradict the Kambe Declaration with any showing that the claimed compositions of matter could be produced by ANY known method or obvious method.**

The Examiner asserts that Applicants' present claims do not preclude a tail in the distribution. That is incorrect. Claim 1 requires that essentially no particles have a diameter greater than three times the average diameter. Thus, there is no tail in the distribution.

The Examiner further asserts that Applicants have not shown that any tail defined in the Rostoker patent are not within the present claims. After significant effort, Applicants do not understand the Rostoker distribution. Applicants have addressed the issue of the tail in the prior art the only way that they know, by trying to establish whether other known methods could be used to produce the claimed composition of matter. Applicants have presented evidence that the Siegel patent and other known or obvious method could not produce the claimed compositions of matter.

The Examiner has specifically commented on Applicants' arguments regarding the Rostoker patent. The Examiner has asserted that Applicants have not "provided any evidence to support" their arguments that the distribution disclosed by Rostoker has a correspondingly large tail. Applicants, however, have provided evidence that the approach in the Siegel 5,128,081 patent cited by the Rostoker patent does not lead to Applicants' claimed particle sizes. Similarly, the Kambe Declaration was presented as evidence that other known or obvious methods similarly could not produce Applicants claimed particles with a narrow particle size distribution. The Examiner asserts that the Rostoker patent teaches a distribution in claim 10 that reads onto Applicants' claimed distribution. Applicants do not agree with this statement. Applicants request that the Examiner explain **how claim 10 of the Rostoker patent reads onto Applicants' claimed invention**.

Applicants have addressed in the only ways that have been clear to them all of the issues raised by the Examiner. Applicants have been unable to ascertain any other suitable evidence to

address the rejections. Specifically, the Rostoker patent describes no independent methods for producing alumina that Applicants can try to reproduce. While the Examiner has suggested a demonstration of unexpected results, Applicants are unsure what materials to directly compare against as appropriate proof of unexpected results. In addition, such unexpected results are legally unnecessary if there is no known or obvious method for producing Applicants' claimed composition of matter. Applicants maintain that the rejections are legally insufficient for the reasons described in the previous section, that the Examiner has failed factually to establish prima facie obviousness, and, to the extent that prima facie obviousness has been shown, that Applicants have rebutted any evidence of obviousness as described above in this section.

Applicants believe that the evidence as a whole indicates that the Patent Office has failed to establish obviousness of the claimed invention.

Rejection of Claims 17 and 18 Over Shimo

The Examiner has taken the position that the method disclosed in the Shimo reference is essentially as claimed by Applicants, absent a showing to the contrary. The Examiner acknowledged that the Shimo patent does not literally disclose a flowing reacting stream. However, the Examiner has taken the position that vapor has "flowing capabilities" and therefore reads on the present claims.

"The general rule is that terms in the claim are to be given their **ordinary and accustomed meaning**. That is, the ordinary and accustomed meaning of a disputed claim term is presumed to be the correct one." K-2 Corp. v. Salomon S.A., 52 USPQ2d 1001, 1004 (Fed. Cir. 1999)(emphasis added). All claim limitations must be taught or suggested by the prior art. See MPEP 2143.03. "[T]he mere fact that the prior art could be so modified would not have

made the modification obvious unless the prior art suggested the desirability of the modification." In re Laskowski, 10 USPQ2d 1397, 1398 (Fed. Cir. 1989)(quoting In re Gordon, 221 USPQ 1125, 1127 (Fed. Cir. 1984).

The Examiner has the burden of establishing a prima facie case of obviousness. In re Brouwer, 37 USPQ2d 1663 (Fed. Cir. 1996). The inquiry into obviousness is highly fact specific. Id. "[T]he conclusion of obviousness vel non is based on the preponderance of evidence and argument in the record." In re Oetiker, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992). The patent office has the ultimate burden of persuasion in establishing that an applicant is not entitled to a patent. Id. at 1447, concurring opinion of Judge Plager. **"The only determinative issue is whether the record as a whole supports the legal conclusion that the invention would have been obvious."** Id (emphasis added).

Pending claim 17 indicates "pyrolyzing the flowing molecular stream . . .." Flow is defined by Mirriam Webster's Collegiate Dictionary, tenth edition (copy attached), as "to issue or move in a stream, circulate, to move with continual change of place among the constituent particles." This standard lay definition is consistent with a formal scientific definition. Applicants also enclose a copy of the definition of flow velocity from a standard Statistical Mechanics Text. Macroscopic flow is related to an average velocity of a group of gas molecules. See Eqs. 18-17 and 18-18 in the Statistic Mechanics text attached below. Thus, if on average the gas molecules are moving randomly in all directions, there is no flow. Gas in a closed container in a lay perspective would have no flow since there is no net movement of the gas and from a scientific perspective also would have no flow since the average velocity would be zero. Just because the individual gas molecules are moving does not create a flow if there is no net movement of the fluid.

Applicants' claimed process involves a **flow** of reactants

through a localized reaction zone. See, for example, page 4, line 29 to page 5, line 2, page 6, lines 3-6, page 9, lines 2-6, page 12, lines 12-23 and page 26, lines 30-33. The flow results in a continuous production of particles within a localized reaction zone. This corresponds to the claimed process in which a flowing molecular stream is pyrolyzed.

In contrast, the Shimo patent describes a batch production process. For example, at column 2, lines 50-54 (emphasis added), the Shimo patent states: "so that a chain reaction is started at the irradiation site in the vapor phase to be propagated throughout the **whole volume** of the vapor phase forming the desired metal-containing compound in a high yield." Furthermore, in the examples of the Shimo patent, the vapor reactants are placed within a 100 milliliter glass vessel. After the reaction, the product particles are found on the wall of the glass vessel.

The Shimo patent **does not teach or suggest** flowing reactant gases in a molecular stream that are reacted while flowing to form product particles. The reactants flow into the chamber, but are not flowing when the reaction is initiated. **Flow is a net movement of a fluid not the capability to flow or the random motions of individual gas molecules apart from the collective properties of the gas.**

Flow should be given its regular and accustomed meaning since Applicants use the regular and accustomed meaning in the specification of the word flow. Flow means net movement of a fluid. According to Webster's Dictionary, copy attached, a fluid is a material "capable of flowing." **Thus, under the Examiner's view, all fluids (liquids and gases) are always flowing since they are capable of flowing.** This view is not reasonable.

The Shimo patent does not describe the reaction of a gas that is flowing, i.e., having net movement. Expanding the meaning of "flow" to cover the capability of a vapor to flow is

unreasonable. Thus, the Shimo patent does not render Applicants' claims 17 and 18 obvious. Applicants maintain that claims 17 and 18 are free of the prior art.

CONCLUSIONS AND REQUEST FOR RELIEF

Applicants submit that claims 1-3 and 5-22 are unobvious over the prior art of record. Applicants believe that the Examiner has failed to establish prima facie unpatentability of any of the claims. To the extent that the Examiner has provided a prima facie showing of unpatentability, Applicants have provided adequate evidence to establish patentability over the issues of record. Thus, Applicants respectfully request the reversal of the rejections of claims 1-3 and 5-22 and the allowance of claims 1-3 and 5-22.

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Respectfully submitted,

WESTMAN, CHAMPLIN & KELLY, P.A.

By: Peter S. Dardi

Peter S. Dardi, Ph.D., Reg. No. 39,650
Suite 1600 - International Centre
900 Second Avenue South
Minneapolis, Minnesota 55402-3319
Phone: (612) 334-3222
Fax: (612) 334-3312

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APPENDIX

1. Definitions from Mirriam Webster's 10th Collegiate Dictionary
2. Pages 402-407 from Statistical Mechanics, By Donald A. McQuarrie.